

Attorney Docket No.: SIT-0106
Inventors: Esche and Nazalewicz
Serial No.: 09/954,994
Filing Date: September 18, 2001
Page 2

In the Specification:

Please replace the paragraph beginning at page 4, line 29,
with the following rewritten paragraph:

a' Figure 1 shows a side view of a pneumatic unit comprising an upper pressure chamber 10 and a lower pressure chamber 12 present on either side of a non-linear spring 14, a load supporting rod 16, a top support plate 18, a bottom support plate 20, a supporting plate 22, fasteners 24 and connectors 26. The non-linear spring 14 is comprised of an upper metal support 28, an elastomeric isolator 30, and a lower metal support 32. The upper pressure chamber is comprised of a top side 34, an upper cylindrical side wall 36 with a top edge and a bottom edge, upper rubber bellows 38, an upper air inlet 40, and a bottom side to the upper pressure chamber 42. The lower pressure chamber 12 is comprised of a top side 44, a lower cylindrical side wall 46, lower rubber bellows 48, a lower air inlet 50, and a bottom to the lower pressure chamber 52. The upper pressure chamber contains rubber bellows with a top edge 54 and bottom edge 56. The top edge 54 of the upper rubber bellow 48 is secured between the underside of the upper pressure chamber top 34 and the top edge of the cylindrical side wall 36. The bottom edge of the

Attorney Docket No.: SIT-0106
Inventors: Esche and Nazalewicz
Serial No.: 09/954,994
Filing Date: September 18, 2001
Page 3

a' com 4

upper pressure chamber rubber bellows is secured between the bottom edge of the cylindrical side wall 36 and the top edge of the lower metal support 32 of the nonlinear spring 14. The lower pressure chamber 12 contains a lower rubber bellows 48 with a top and bottom edge. The top edge of the lower rubber bellow 48 is secured between the bottom side of the lower metal support 32 and the top edge of the lower pressure chamber cylindrical side wall 46. The bottom edge of the lower rubber bellow 48 is secured between the bottom edge of the cylindrical side wall 46 and the top edge of the bottom support plate 20. The upper pressure chamber rubber bellows 38 and lower pressure chamber rubber bellows 48 secured in this way each take on a doughnut shape. An upper air inlet 40 present on the cylindrical side wall 36 of the upper pressure chamber 10 allows air to be pumped into the upper pressure chamber 10 which transfers increased load onto the nonlinear spring 14. A top support plate 18 is in contact with the top side of the upper pressure chamber 10. The top support plate 18 is attached by fasteners 24 to connectors 26 which are attached to the top side of a supporting plate 22. The bottom side of the support plate 22 is attached to the bottom support

Attorney Docket No.: SIT-0106
Inventors: Esche and Nazalewicz
Serial No.: 09/954,994
Filing Date: September 18, 2001
Page 4

a!
cont
plate 20 by multiple fasteners 24 to the under side of the bottom support plate. A load supporting rod 16 runs from the top support plate 18 through the center of: the space in the center of the upper rubber bellows 38 in the upper pressure chamber 10, the nonlinear spring 14, the supporting plate 22, space in the center of the lower rubber bellows 48 in the lower pressure chamber 12 and the bottom support plate 20. The load supporting rod 16 has a smaller diameter at the lower end and a larger diameter at the upper end. The larger diameter end of the load supporting rod 16 passes through the center of the top support plate 18 and through the space in center of the doughnut shaped upper rubber bellows 38 of the upper pressure chamber 10. Due to its larger dimension, the larger diameter end of the load supporting rod 16 can not pass through the hole in the top of the upper metal support 28 of the nonlinear spring 14. The actuator is part of a pneumatic system including a pump, pressure chambers, and a pressure reservoir to facilitate rapid response times for stiffening and softening. By introducing air into the upper pressure chamber 10, a load is applied to the nonlinear spring. Similarly, the lower pressure chamber 12 reduces the load on the non-linear spring 14. A load due to pressure in the

Attorney Docket No.: SIT-0106
Inventors: Esche and Nazalewicz
Serial No.: 09/954,994
Filing Date: September 18, 2001
Page 5

a!
con't

upper chamber is added to the external supported load while a load due to pressure in the lower chamber is subtracted from the external supported load. The nonlinear spring 14 stiffness changes with varying loads. By applying pressure to either the upper pressure chamber 10 or the lower pressure chamber 12, the natural frequency of the system may be regulated. One or two pressure chambers may be present depending on the application. Using this device, adaptive vibration attenuation is implemented by passive vibration mounts that allow the adjustment of their dynamic stiffness characteristics in response to changes in the excitation or loading conditions. The mount stiffness is varied by combining a passive vibration mount with highly non-linear force-deflection characteristics with a one-directional or bi-directional pneumatic actuator. These adjustments of mount characteristics result a change of the natural frequency by shifting the operating point of the nonlinear spring. Non-invasive, non-contact sensors are used together with hardware- or software-based signal processing to identify the excitation displacement and/or force signal and to generate the appropriate adjustments of the passive vibration mount characteristics.
